Three-Dimensional Modeling of DNA Damage

In this activity, you will model DNA and DNA damage.

Objectives:

- Visualize the three-dimensional structure of DNA
- Simulate the random damage to DNA caused by radiation
- Describe molecular changes as a result of radiation damage

Research Question:
What types of damage can arise from high-energy particles hitting DNA?

Discussion Questions:
What bonds are the easiest to break?
How many breaks do you get with a single hit?
How easy is it to repair the damage?
How does your choice of model affect the type of damage observed?
What type of damage is most difficult to repair?
How does this relate to the types of damage that more difficult for biological repair systems in cells to recognize and repair?

Materials:
DNA Building kit (DNA models can be constructed using a few common kitchen items; plastic kits can also be purchased)
Two to three partners (this activity is best done as a team)

Methods:

(1) Construct a DNA model. Have one team member remove a bond while the others are not looking. Ask the students to identify which bond has been "broken." Record the type of damage that occurred.

(2) Have the students repair the damage. Repeat the exercise by removing one or more bonds, bases or nucleotides. This represents the various types of damage that can occur.

(**Note:** Equipment and materials for this activity are also commercially available from various educational resources.)

References:
DNA model projects:

http://www.miniscience.com/projects/DNAmodel/index.html

http://www.planet-science.com/outthere/index.html?page=/outthere/diner/play/09.html

http://www.powertolearn.com/teachers/lesson_activities/science/CBV.35.E.SCI.R2.F.pdf